UCRL-JC-126768 Abs

High Energy Beam Lifetime Analysis

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We have developed a positron lifetime defect analysis capability based on a 3 MeV electrostatic accelerator. The high energy beam lifetime spectrometer is operational with a 60 mCi ^{22}Na source providing a current of 7 10^5 positrons per second. Lifetime data are derived from a thin plastic transmission detector providing an implantation time and a BaF_2 detector to determine the annihilation time. Positron lifetime analysis is performed with a 3 MeV positron beam on thick sample specimens at counting rates in excess of 2000 per second. The instrument is being used for bulk sample analysis and analysis of samples encapsulated in controlled environments for in situ measurements. We will describe elements of the high energy beam and discuss uses of the instrument in studying defect distributions in composite materials and radiation damaged metals.
This work was performed under the auspices of the US Department of Energy by LLNL under contract No. W-7405-ENG-48.

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